# PROJECT FACT SHEET

**CONTRACT TITLE:** Reactivation of an Idle Lease to Increase Heavy Oil Recovery through Application of Conventional Steam Drive Technology -- Class III

**ID NUMBER:** DE-FC22-95BC14937

**B&R CODE:** AC1010000

**CONTRACTOR:** University of Utah
Office of Sponsored Projects

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**DOE PROJECT MANAGER:**

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**PROJECT SITE**
**CITY:** Salt Lake City **STATE:** UT
**CITY:** Midway-Sunset Field, Kern County **STATE:** CA
**CITY:** Kern County **STATE:** CA

**CONTRACT PERFORMANCE PERIOD:**
6/14/1995 to 3/30/2001

**PROGRAM:** Reservoir Life Extension
**RESEARCH AREA:** Class 3
**PRODUCT LINE:** ADIS

**CO-PARTICIPANTS:**

| | | | |
|---|---|---|---|
| **PERFORMER:** ARCO Western | **CITY:** Bakersfield | **STATE:** CA | **CD:** |
| **PERFORMER:** Utah Geological Survey | **CITY:** Salt Lake City | **STATE:** UT | **CD:** |
| **PERFORMER:** AERA Energy | **CITY:** Bakersfield | **STATE:** CA | **CD:** |
| **PERFORMER:** California Div. Oil, Gas & Geothermal Resources | **CITY:** | **STATE:** | **CD:** |

| FUNDING (1000'S) | DOE | CONTRACTOR | TOTAL |
|---|---|---|---|
| PRIOR FISCAL YRS | 2170 | 3599 | 5769 |
| FY 2001 CURRENT OBLIGATIONS | 0 | 0 | 0 |
| FUTURE FUNDS | 0 | 0 | 0 |
| TOTAL EST'D FUNDS | 2170 | 3599 | 5769 |

**OBJECTIVE:** The objectives of the project are (1) to return the shut-in portion of the reservoir to commercial production; (2) to accurately describe the reservoir and recovery process; and (3) to convey the details of this activity to the domestic petroleum industry, especially to other producers in California, through an aggressive technology transfer program.



Sept 2001

**PROJECT DESCRIPTION:**

**Background:** The 40-acre Pru Fee property is located in the 100-year oil, super-giant Midway-Sunset Field and produces from the late Miocene Monarch Sand, part of the Monterey Formation. In 1991 cumulative production from the field reached two billion bbl, with remaining reserves estimated to exceed 695 million bbl of oil. In the Pru Fee property, now held by ARCO Western Energy, cyclic steaming was used to produce 13 degree API oil. However, the previous operator was unable to profitably develop this marginal portion of the Midway-Sunset Field using standard EOR technologies and left nearly 3.0 million bbl of oil in the ground. Only 927 thousand bbl of oil had been produced from the property when it was shutin in 1987. This is less than 15% of the original oil-in-place, which is insignificant compared to typical heavy oil recoveries in the Midway-Sunset field of 40% to 70%. The objective of the demonstration project is to encourage a similar incremental increase in production in all other marginal properties in the Midway-Sunset and adjacent fields in the southern San Joaquin Basin. If successful, the demonstration project could directly result in an ultimate increases in domestic production of at least 80 million bbl of oil that otherwise would be left in the ground.

**Work to be Performed:** In the first budget period, two wells will be drilled and logged, flow units in the Monarch lease will be correlated, stratigraphic and structural cross sections of the reservoir will be constructed, and 8 oil wells and 1 new well will be stimulated. Cyclic steaming will be used to reestablish baseline production within the reservoir characterization phase of the project. During the demonstration phase (second budget period), a continuous steamflood enhanced oil recovery (EOR) will be initiated to test the incremental value of this method as an alternative to cyclic steaming. Operators will drill and log 11 producing wells, 4 injections wells and 3 observation wells, install production and injection facilities, and perform the steamflood demonstration project. It has been determined that a nine-spot drilling pattern with steamflood will give maximum potential production. Two nine-spot patterns were in place in 1998. Details of the project and methodology will be conveyed to a broad segment of the industry, especially to other producers in the field and California through an aggressive technology transfer and outreach program. Current estimates for the 8 acre pilot site indicate 2.5 MMBbls ROPI increased from original estimate of 2 MMBbls. Conventional vertical steam flood well recovery from the 8 acre plot over the next 5 years is estimated at 16% of OOIP, and two appropriately placed horizontal well would recover an additional 15% OOIP.

**PROJECT STATUS:**

**Current Work:** AERA Energy in October 1998. The project was granted a 1 year extension to make the transfer of field operation from ARCO to AERA. Incremental production continued to increase throughout 1999. Project is completed.

**Scheduled Milestones:**

| | |
|---|---|
| Install lease production and injection | 10/98 |
| Update reservoir simulation; continuous process of history matching | 06/00 |
| Monitor steamflood pilot | 01/01 |
| Transfer information learned from demonstration to other operators in region | 02/01 |
| Project completed | 03/01 |
| Final report (in progress) | |

**Accomplishments:** Preliminary numerical simulations indicate that the site, previously considered sub-commercial, may exceed projected production by an innovatively configured conventional steamflood strategy. Under the cyclic baseline testing of the characterization phase, the 8-acre site produced at an average rate of 70 barrels of oil per day. Early in the demonstration phase before the steam chest was fully developed and before optimization of production factors, the average daily production had increased to well over 300 barrels. The optimal injection interval for the Monarch Sand has been determined to be 90 to 100 feet above the oil water contact. Estimates from core indicate 25-28% recovery from the Monarch. Results by mid 1998 have encouraged ARCO to propose drilling 20 new wells around the margin of the Pru Lease. Two nine-spot patterns were in place in 1998. Core and temperature analysis have revealed new oil reserves in the overlying Tulare which may equal or surpass production from the Monarch sand of the Pru lease (2.7 MBO). The target additional recoverable reserves from the Monarch sand in the Midway-Sunset field, 40 acre Pru Fee property are 2.9 MMBO or greater. University of Utah project has taken a shut-in non producing lease and proved, through field testing, that intelligently applied modification of existing steam injection technology could effectively produce significant volumes of oil from a property which had been abandoned by industry as a potential source for recoverable oil. As of June 2000, after 40 months of steam flood production, the cumulative production of oil from the project was 735,700 bibles of oil, with daily production at 1,280 bopd (March 2001). Expanding the technology proven at this project site to potential adjacent target reservoirs, with similar non-productive properties in

California has major potential positive effect on domestic oil production. Project received the 1998 Hart's Award for Best Advanced Recovery Project in the Pacific Section.
During 2000 production continued to increase significantly. Daily production rose to over 1,500 bbl per day in the second half of 2000. In the 4th quarter 2000 the 8-acre pilot produced 54,900 bbl and the surrounding 32 acres of the Pru produced 47,800 bb. Only 11,700 barrels of steam were injected in the pilot to produce this amount. After four years of injection large amounts of steam are no longer required to maintain temperatures and production. The technologies and methodologies employed by the project have spread to three additional leases in the Midway-Sunset field. 54 new producers and 10 new injectors have been drilled and placed on line external to the steamflood pilot. The final report is in press.

The Pru Fee lease was closed down in 1986 following 80 years of production, during this period it produced 2.4 MMBO , which was just 22.1 % of the original oil in place. The Pru lease was idle for nearly 10 years before The University of Utah and ARCO Western reactivated it as part of the DOE Class III demonstration. Since production resumed in late 1995, over 1 million barrels of incremental oil has been produced. Ultimate production from the reactivated lease is expected to reach 4 MMBO.

**TECHNOLOGY TRANSFER:**
**Technology/Information Transfer:** 1) Public workshop held in Bakersfield, CA February 20, 2001.
2) Contacts are being made with the operators of 29 idle Midway-Sunset leases to determine if these properties would benefit from the technologies employed at the Pru lease. By the end of the project AERA and other operators had reactivated three of these leases based on the work at Pru.
3) The Summer 2001 issue of The Class ACT features as the lead article "Reactivation of the Idle Pru Lease of Midway-Sunset Field, San Joaquin Basin, CA" by Steven Schamel. Dr. Schamel received several calls for additional information following publication of the article.
4) An article is in press in the AAPG Bulletin by Dr. Schamel and other project participants expanding the geological analysis and technological success of the project.
**Public Relations:** Secretary of Energy Abraham made a Press Release on the Success of the Pru reactivation in March 2001. As a follow up to this announcement several trade journals including Oil and Gas Journal and American Oil Reporter published articles based on the Press release in March and April.
The July 2001 issue of Hart's E & P contains an article entitled, "Pru Fee project a DOE winner"

Updated By: **Viola Rawn-Schatzinger** Date: **7/18/2001**